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GENERAL NOTES.

Members and friends of the Society are invited to aid the Committee on Publication in carrying out the work of this department. Communications of general interest will be gladly received, and may be sent to SIDNEY D. TOWNLEY, 2023 Bancroft Way, Berkeley, California.

Professor F. P. BRACKETT, kindly sent to the Society a report of the observations of the *Leonids* made by volunteers from the astronomy class of Pomona College, on the mornings of November 14, 15, and 16, 1901. Unfortunately, the manuscript was received too late for insertion in our last number. As the observations have since then been printed in *Popular Astronomy* (March, 1902, p. 165), we shall merely summarize them. In all, 1,590 meteors were seen on the three mornings, 1,483 of them being *Leonids*. The thick of the shower came between 3:00 and 5:30 A.M., November 15th, reaching a climax between 4:30 and 5:00 A.M., when 400 were seen in half an hour, the average interval being 4 seconds. The least time for ten meteors was 15 seconds from $4^h\ 0^m\ 15^s$ to $4^h\ 0^m\ 30^s$. The magnitude and depth of color both increased with the frequency. At the time of greatest frequency more than a quarter of them were of the first magnitude or brighter, and more than a score were seen whose magnitude, length of path, and general appearance were magnificent.

"Veröffentlichungen des Königlichen Astronomischen Rechen-Instituts zu Berlin, No. 16," has been issued recently. The title is "Tabellen zur Geschichte und Statistik der kleinen Planeten," and the work was prepared by Director BAUSCHINGER, with the collaboration of Dr. NEUGEBAUER. The work is arranged in about a dozen tables, and much interesting and useful information is given.

NOVA PERSEI. — In Number 81 of these *Publications* I gave a few notes concerning the progress of our knowledge of the new star in *Perseus*. This wonderful object is still of great interest, and nearly every astronomical journal brings forth an account of some new investigation.

Light Curve. — There is but little to add under this head. The brightness of the star is gradually decreasing. It is now (March 26th) between the eighth and ninth magnitude. Most observers seem to agree that the periodic variation of brightness which was so marked last spring has completely died out. The winter weather in Berkeley, however, has been so persistently

bad that it has been impossible to make more than a few scattering observations. Dr. WILSON is continuing the collection and publication (in *Popular Astronomy*) of all the magnitude observations that have been made on the star.

Color.—A study of the color of the new star in *Perseus* has led to some interesting results. At greatest brightness, the color of the star was white; as it declined, it passed through yellow, orange, and red. Some observers report that it has a greenish tint now. The most complete investigation of its color has been made, I think, by Herr OSTHOFF, of Cologne, (*A. N.*, No. 3751). He has collected numerous observations — not all — and reduced them to a common scale, that of SCHMIDT. In this system the colors of stars are designated by the numerals 0 to 10 the significance being 0 = white; 1 = yellowish white, etc.; 9 = red, with least touch of yellow; 10 = red. OSTHOFF has plotted his results, and there is almost a complete correspondence between the resulting color-curve and the light-curve. During April and May, when the star showed the greatest variations of brightness, there were corresponding changes in color. At the minima the star was decidedly red, but there was a considerable tinge of yellow in its color at the maxima. For a change of one magnitude in brightness the color changed about 0.8 of a step.

Spectrum. — The spectroscope has provided a large amount of material, but no one as yet has made, as far as I know, a thorough discussion of it. This is, without doubt, a rich field for study, and it is to be hoped that some one will take it up soon. The changes in the spectrum are fully as interesting as those in the brightness and color. On the date of discovery the spectrum was continuous, with a few dark lines, but by February 25th there were both bright and dark lines. During March and April two distinct types of spectra were observed, called by PICKERING the normal spectrum and the peculiar spectrum, the chief difference between them being that in the normal one the continuous spectrum was very strong, while in the peculiar one the continuous spectrum was rather weak, and a few bright lines were very prominent, which, perhaps, was due to a fading out of the weaker lines rather than to any increased brilliancy of the brighter lines. H_β, H_γ, and H_δ were among the most prominent of the brightest lines. This peculiar spectrum has been called a gas spectrum. PICKERING and VON GOTHARD have found that the so-called normal spectrum was always seen at the time of the star's

maximum of brightness and the peculiar (or gas) spectrum at the time of the minimum of light. SIDGREAVES finds, however, from a discussion of the observations made at Stonyhurst and at Oxford, that the changes of the spectrum follow not the phases of the light curve, but the absolute magnitudes of the star's brightness. He found that the peculiar spectrum always appeared when the brightness was less than 4.57 magnitude, and that the normal spectrum always returned when the magnitude became greater than 4.57. One spectrogram, taken when the magnitude was just 4.57 gave a spectrum showing some of the characteristics of both the normal and the peculiar spectra. In June or July the spectrum changed again, and then showed the characteristic lines of a planetary nebula. It has remained of that same nature since then.

One peculiar thing about the spectrum of *Nova Persei*, as well as of *Nova Aurigæ*, is that each bright hydrogen line is accompanied on the side toward the violet by a dark companion line. The interpretation given in 1892 was based upon DOPPLER'S well-known principle; that is, that we were observing two bodies, one giving a bright-line spectrum, the other a dark-line spectrum, and the one was moving toward us and the other away from us. The displacement of the lines, however, was large and velocities from 1,000 to 1,500 kilometers per second were necessary in this explanation. This state of affairs might subsist for a few days, but hardly for several months, as was observed in the *Nova Aurigæ*. Two other new stars discovered subsequent to *Nova Aurigæ* exhibited the same kind of spectra, and the new star of 1600, *P. Cygni*, which is still visible as a faint star, showed upon investigation the same spectrum also. Other explanations are now offered, and one of the most rational of these seems to be that proposed by Professor WILSING, of Potsdam. HUMPHREY and MOHLER found from laboratory experiments that the wave-length of a line could be changed by pressure. They were able to employ pressures of twelve atmospheres, but the displacement was very slight. WILSING was able to obtain much greater pressure by utilizing the disruptive discharge between metallic electrodes in water, which occurred with explosive violence and caused a rise of several hundred atmospheres in the pressure of the spark. In this way he was able to obtain displacements comparable with those found in new stars. WILSING and VOGEL have explained the conditions of a star necessary to give these

great pressures. (See *Sitzungsberichte der k. Akademie der Wissenschaften zu Berlin*, May and July, 1899; also, *Astrophysical Journal*, Vol. X, pp. 113, 269; Vol. XIII, p. 217.)

Parallax. — No definitive determination of the parallax of the *Nova* has yet been made. Such as have been made, however, show that it must be exceedingly small, and Professor KAPTEYN thinks that it cannot be over one or two hundredths of a second of arc.

Nebulosity. — Several theories have been offered to explain the motions discovered by PERRINE in the nebula about the *Nova*. If we think that there has been an actual displacement of matter, and admit that the parallax does not exceed one or two hundredths of a second, then velocities comparable with those of light are necessary to explain the observed displacements. This is hardly conceivable, but not on that account impossible.

Professor KAPTEYN has suggested (*A. N.*, No. 3756) a theory which has been very favorably received by many. He assumes that the nebulosity, which surrounds the star, has no, or only very little, light of its own, and explains that the effect observed on the photographic plate is that of reflected light from the star itself. When the star first broke forth into great brilliancy, the nebulosity lying nearest to the star would, of course, be made visible first; and as the light-waves traveled outward new portions would be made visible. At the same time, however, as the brilliancy of the star began to decrease, the inner portions of the nebula would become less brilliant or entirely invisible. We would then have portions of maximum brilliancy apparently traveling outward.

The chief source of difficulty with this explanation, according to KAPTEYN, is, will this reflected light be strong enough to affect a photographic plate? This question was fortunately soon answered by Professor SEELIGER, of Munich, (*A. N.*, No. 3759,) who explains that his investigations have led him to almost identically the same conclusions as were reached by KAPTEYN. SEELIGER states, also, that he has already investigated the illumination of a nebula by a star, and he applies the criteria to the case in hand. He found that if we had a star and a nebula at a distance such that the parallax were $0''.01$, then a star of the 10.4 magnitude would illuminate the nebulosity to a distance of $10''$, with an intensity, under certain conditions, of 10^{-7} times the brightness of the full Moon. Now, the *Nova* was, at its brightest,

about twelve thousand times as bright as a star of the 10.4 magnitude, and SEELIGER finds that that would have been sufficient to illuminate the nebulosity to a distance of 1100″. A translation of KAPTEYN'S article is given in *Popular Astronomy*, March, 1902.

Professor WILSING has offered another explanation (*A. N.*, No. 3765). He thinks that we have here a manifestation similar to that exhibited in comets; that is, that the star is possessed of a repulsive force by which rarefied matter is driven off into space, as the matter of a comet is driven off into the tail by a supposed repulsive force of the Sun. The idea that tremendous repulsive or explosive forces may at times be active in a star has been expounded and developed recently by Professor VERY (*American Journal of Science*, January, February, March, 1902.)

S. D. T.